

The effect of high physical load at work on physical function at old age

A Burdorf

Commentary on the paper by Russo *et al* (see page 438)

There is ample evidence of large socioeconomic inequalities in morbidity and mortality in Western Europe. In most countries these socioeconomic inequalities in health seem quite persistent, and people with lower education, social class, or income more often suffer from ill health and die at a younger age.¹ Since most morbidity and mortality happen at older age, the determinants of health among frail elderly people are increasingly studied. There is much debate as to the relative contribution of different lifestyle factors, such as smoking and leisure time physical activity. It is well documented that lack of leisure time physical activity is a powerful predictor for functional limitations, disability, and mortality at older age, most likely through its beneficial effects on physical fitness.^{2,3} Given these strong associations, it comes as a surprise that little is known about the effects of physical activity at work on morbidity and mortality after retirement. In some occupations the duration of physical activity at work will easily supersede vigorous exercise in leisure time, and thus it may be hypothesised that workers in physically active jobs may experience beneficial effects on health in later life.

The study in this issue by Russo and colleagues among persons at old age shows exactly the opposite.⁴ Workers with a history of blue collar jobs had a significantly lower physical function than workers in white collar jobs; they performed worse in physical assessment tests, such as walking speed over a 4 metre course, and had a more than 10% reduced hand grip strength. The study has certain limitations, most notably its cross-sectional design, the potential for recall bias in the self-reported physical activity at work and physical activity in leisure time in early adulthood, and the lack of control for selective survival since only subjects who reached the age of 80 years were studied. However, their results may have great implications since hand muscle strength predicts disability and

mortality. A 25 year prospective study among middle-aged men who were healthy at baseline showed that the risk of disability was 1.8 and the risk of mortality about 1.3 in the lowest versus the highest grip strength tertile.^{3,5}

The study of Russo and colleagues mirrors the findings of a long term cohort study among Finnish workers in the metal industry. In this study it was observed that vigorous exercise in leisure time was associated with a good physical function 28 years later, but that among those workers with physically strenuous work the risk of a poor physical function was increased.⁶ These remarkable associations were little influenced by adjustment for age, sex, number of chronic diseases, lifestyle factors (for example, smoking), and body mass index.

The results in both studies raise the important question of why physical activity at work is apparently not the same as physical activity in leisure time. A possible mechanism might be that physical load at work is associated with a variety of musculoskeletal disorders, which consequently may result many years later in a reduced function of joints and muscles of the musculoskeletal system. It has indeed been shown that workers in occupations with a high physical load are at risk for earlier onset of osteoarthritis of hip, knee, and hand.⁷ In addition, those subjects with a good physical functioning also tend to exercise more than those less fit.⁶ Although Russo and colleagues adjusted for disease status in their statistical analysis, the presence of residual confounding cannot be excluded. A second explanation may arise from the interrelationship between blue collar work and socioeconomic status, since workers in jobs with high physical load are also likely to be less educated and have a lower income. Socioeconomic status certainly influences physical functioning at older age, but the effect of physical load at work on physical functioning has also been shown in more comparable strata of blue collar

workers.⁶ A third explanation may be sought in health selection into physically strenuous jobs, but this seems unlikely since positive associations have been found between heavy physical work and a high level of fitness in young workers.⁸

The opposite effects of physical activity at work and in leisure time on physical functioning and morbidity must be partly due to their differences in loads on the human body.⁶ Physical activity in leisure time is at the discretion of persons themselves and it is expected that this activity will be a reasonable balance between demands and capabilities. At work frequency and duration of physical load may be considerably higher and exceed the physical capabilities of a person. This emphasises the importance to prevent a long term imbalance between physical demands at work and individual physical capacity.

The study of Russo and colleagues shows that the impact of physical load at work may extend well beyond working life. This stresses the need to study not only the effect of physical load at work on musculoskeletal disorders in occupational populations, but also to evaluate the impact of strenuous working conditions on healthy ageing after retirement.

Occup Environ Med 2006;**63**:437.
doi: 10.1136/oem.2006.027623

Correspondence to: Dr A Burdorf, Department of Public Health, Erasmus MC, PO Box 2040, 3000 CA Rotterdam, Netherlands; a.burdorf@erasmusmc.nl

REFERENCES

- 1 Mackenbach JP, Kunst A, Cavelaars A, *et al*. Socio-economic inequalities in morbidity and mortality in Western-Europe. *Lancet* 1997;**349**:1655-9.
- 2 Kaplan GA, Seeman TE, Cohen RD, *et al*. Mortality among the elderly in the Alameda County Study: behavioral and demographic risk factors. *Am J Public Health* 1987;**77**:307-12.
- 3 Rantanen T, Guralnik JM, Foley D, *et al*. Midlife hand grip strength as a predictor of old age disability. *JAMA* 1999;**281**:558-60.
- 4 Russo A, Onder G, Cesari M, *et al*. Lifetime occupation and physical function: a prospective cohort study on persons aged 80 years and older living in a community. *Occup Environ Med* 2006;**63**:438-42.
- 5 Rantanen T, Harris T, Leveille SG, *et al*. Muscle strength and body mass index as long-term predictors of mortality in initially healthy men. *J Gerontol* 2000;**55A**:M168-73.
- 6 Leino-Arjas P, Solovieva S, Riihimäki H, *et al*. Leisure time physical activity and strenuousness of work as predictors of physical functioning: a 28 year follow-up of a cohort of industrial employees. *Occup Environ Med* 2004;**61**:1032-8.
- 7 Rossignol M, Leclerc A, Allaert FA, *et al*. Primary osteoarthritis of hip, knee, and hand in relation to occupational exposure. *Occup Environ Med* 2005;**62**:772-7.
- 8 Tammelin T, Näyhä S, Rintamäki H, *et al*. Occupational physical activity is related to physical fitness in young workers. *Med Sci Sports Exerc* 2002;**33**:158-65.